REMARKS/ARGUMENTS

I. Introduction:

Claims 1, 9, 11, 20, 23, 25, 27, 29, 31, 35, and 41 are amended, claims 42-47 are added, and claims 2, 5, 15, 18, 24, and 28 are canceled herein. With entry of this amendment, claims 1, 4, 7-9, 11, 14-15, 19-20, 22-25, 27-31, and 33- 47 will be pending.

II. Claim Rejections – 35 U.S.C. §103:

Claims 1, 2, 4, 6-9, 11, 14, 15, 18-20, 22-25, 27-29, 31 and 37-41 stand rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent No. 6,757,255 (Aoki et al.) in view of U.S. Patent No. 6,657,987 (Kumar et al.) in further view of U.S. Patent Application Publication 2002/0194343 (Shenoi et al.). Claims 33-36 stand rejected under 35 U.S.C. 103(a) as being unpatentable over Aoki et al. in view of Kumar et al., in further view of Shenoi et al. and "Network Traffic Characterization Using Token Bucket Model" (Tang et al.).

Aoki et al. disclose an apparatus for measuring communication performance. The apparatus measures the performance in the TCP communications on a communications route of a network. An average value of round trip times is obtained based on a small number of measurement-oriented packets at an interval of fixed time, a maximum segment size obtained based on a packet size of the packets transmitted and received, and a maximum congestion window size estimated from a time change in the round trip time, are used as performance indexes. Aoki et al. do not show or suggest calculating a burst parameter based on collected traffic data or calculating a burst-rate traffic profile responsive to traffic data collected at a queue over a time interval and a specified bandwidth (associated rate).

In contrast to applicant's invention, Aoki et al. obtain performance indexes of a round trip based on direct measurement of packets transmitted and received. Direct measurement is cumbersome and provides only information about current conditions. It

does not predict how the system will perform under different traffic conditions, or how the system will perform with a different allocation of resources. Being able to analyze network performance under hypothetical conditions is useful, for example when a customer and internet service provider agree to the customer sending increased voice and video traffic. Such traffic is burstier than data traffic. Applicant's invention, as set forth in the claims, can be used to estimate the effect of an increase in bursty traffic on delay and obtain an estimate of periodic worst-case delay in a way that is scalable to large networks, and does not disrupt normal network performance.

As noted by the Examiner, Aoki et al. also do not disclose calculating a periodic worst-case delay.

The Kumar et al. patent is directed to scheduling in a Time Division Duplex (TDD) wireless communication network. A method disclosed in Kumar et al. includes scheduling of periodic voice slots for a link between a master and slave transmission on a wireless channel. Fig. 1 illustrates an envelope of incoming traffic to a wireless connection. The arrival and service curves are shown. A burst of maximum size arrives at a peak rate, after which, until the buffer is emptied, the arrivals are at an average rate. The graph of Fig. 1 is based on measurements of incoming traffic rather than calculations based on a specified or negotiated rate.

Kumar et al. do not show or suggest calculating a burst parameter based on traffic data collected at a queue and a specified bandwidth. The burst parameter referred to in the Kumar et al. patent is a maximum burst size, which is the measured size of a single burst.

Furthermore, Kumar et al. do not teach calculating a burst-rate traffic profile responsive to traffic data collected at the queue and a specified bandwidth. In rejecting claim 1, the examiner refers to equation 1 of Kumar et al. This equation calculates a token rate based on a service rate, number of packets served in a wireless session, and a maximum packet length (see, for example, col. 5 and claim 1). Fig. 2 is a graph illustrating the basis on which the equation is derived. The graph shows the relationship between a polling interval and service quantum, service rate, and maximum bandwidth. Equation 1 is not used to calculate a burst-rate traffic profile. Instead, it is used to calculate a token rate.

The Examiner next refers to col. 6, lines 40-67 of the Kumar et al. patent. This section of the patent discusses a method for modeling a guaranteed connection as a periodic task with deadlines. A periodic task is defined as a sequence of requests for "c" units of service time. This allows a connection to be serviced before its deadline. This model is used to ensure that that maximum time away from a connection is less than 2 times a period "p" of the periodic task and that a bandwidth c/p worth of service is given to the connection every p units of time. Kumar et al. are concerned with scheduling a guaranteed connection rather than calculating a burst-rate (or other) traffic profile based on collected data. The periodic tasks and required service time are known and not based on data collected over a time interval. Periodic tasks are scheduled depending upon a polling interval which is derived based on defined QoS requirements as set forth in col. 2. The only parameter used by the scheduler is the polling interval.

Moreover, Kumar et al. do not show or suggest calculating a worst-case delay for a traffic aggregate. Columns 7 and 8 of Kumar et al. describe calculation of the period of composite task from the link layer parameters of the forward and reverse link. The equation at line 46 of col. 7, for example, is used to ensure that maximum tolerable delay is not crossed by either connection. Thus, rather than calculating a periodic worst-cast delay, Kumar et al. use a predefined maximum tolerable delay to calculate a polling interval that satisfies latency requirements. In contrast to applicant's invention, Kumar et al. are concerned with the maximum delay that can be tolerated by a single packet based on polling intervals. The tolerable delay described in Kumar et al. is based only on the polling interval and has no connection to a burst-rate traffic profile based on collected traffic data, calculated burst parameter, and a rate associated with a traffic aggregate, as set forth in claim 1.

Claim 1 has been amended to clarify that the associated rate is a specified bandwidth for the traffic aggregate. The rate referred to by the Examiner in Aoki et al. is a measured or calculated rate (col. 2, lines 22-55) The rate referred to by the Examiner in Kumar et al. is a calculated token rate (rate at which data should be drained from the buffer corresponding to a data connection).

In a sincere effort to expedite prosecution, claim 1 has further been amended to specify that the periodic worst-case delay is calculated by dividing the calculated burst parameter by an allocated bandwidth associated with the queue. As noted above, neither Aoki et al. nor Kumar et al. address calculating a worst-case delay for a burst-rate traffic profile. Furthermore, Aoki et al. are concerned with available bandwidth of a route rather than bandwidth associated with a specific queue. None of the references cited show or suggest calculating a periodic worst-case delay for a burst-rate traffic profile by dividing a burst parameter, calculated based on a specified bandwidth and traffic data collected at a queue, by an allocated bandwidth associated with the queue, as set forth in amended claim 1.

The Shenoi et al. patent application is directed to measurement of time-delay, time-delay variation, and cell transfer rate in ATM networks. ATM is a communications standard based on cell relay techniques. As noted by Shenoi et al., the underlying premise of ATM is that a data stream is segmented into fixed size cells. This differs from TCP/IP, in which messages are divided into packets. Shenoi et al. simply describe sending cells that contain time-stamps. The time-stamp information cell is generated at a first location and then transmitted to a second location. The time-stamp therefore does not specify arrival time. Shenoi et al. do not show or suggest collecting traffic data comprising arrival time of packets or size of packets, as set forth in the claims.

Accordingly, claim 1 is submitted as patentable over Aoki et al., Kumar et al., and Shenoi et al.

Claims 4, 7, 8, and 33-41, depending either directly or indirectly from claim 1, are submitted as patentable for at least the same reasons as claim 1.

Claim 4 is further submitted as patentable because the cited references do not teach utilizing a negotiated rate agreed to by a customer sending the traffic data. The sections of the Aoki et al. patent cited by the Examiner simply discuss how stream services are provided to a client (col. 1, lines 15-25) and measuring communications performance (col. 2, lines 25-67).

Claim 8 specifies that the traffic aggregate is a class of traffic. In rejecting the claims, the Examiner states that "packet data is traffic aggregate, which is a class of traffic" (paragraph 6 of Office Action dated June 20, 2006). Claim 8 further limits claim 1 such that the periodic worst-case delay is an estimate for a specific class of traffic, rather than just a traffic aggregate. None of the references show or suggest calculating a periodic worst-case delay (or any other type of delay) for a class of traffic. Kumar et al. calculate a polling interval for a scheduler and Aoki et al. al. measure performance of traffic at a communications device in a network. There is no disclosure of performing estimates or calculations for specific traffic classes.

Claim 9 is directed to a method of estimating worst-case queuing delay along a path. The method includes collecting a rate parameter and a burst parameter. As previously discussed, neither Aoki et al. nor Kumar et al. show or suggest calculating a periodic worst-case delay associated with rate and burst parameters. Moreover, these references do not teach adding up a periodic worst-case delay associated with routers along a path, as required by claim 9.

Accordingly, claim 9 is submitted as nonobvious over the cited references.

Claim 11 specifies calculating a burst parameter and a burst-rate traffic profile, claims 14 and 27 require code that causes a processor to calculate a burst parameter and code that causes the processor to calculate a burst-rate traffic profile, and claim 23 specifies means for calculating a burst parameter for the collected traffic and means for calculating a burst-rate traffic profile. Claims 12, 14, 23, and 27, and the claims depending therefrom, are submitted as patentable for at least the reasons discussed above with respect to claim 1.

Claims 20 and 29 specify code that causes the processor to receive burst and rate traffic parameters. Claim 25 requires means for periodically collecting rate and burst traffic parameters. Claim 31 specifies that the periodic worst-case delay is based on a burst parameter and a rate parameter. Claims 20, 25, 29, and 31, and the claims depending therefrom, are submitted as patentable for the reasons previously discussed with respect to claim 9.

Applicant respectfully submits that Tang et al. do not remedy the deficiencies discussed above for the primary references.

III. Conclusion:

For the foregoing reasons, applicant believes that all of the pending claims are in condition for allowance and should be passed to issue. If the Examiner feels that a telephone conference would in any way expedite the prosecution of the application, please do not hesitate to call the undersigned at (408) 399-5608.

Respectfully submitted,

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